

IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Currently Amended)) A method of generating object region data relating to an object ~~regions~~ region in frames of moving picture, the frames lined up in a time-series variation, the method comprising:

generating a polygon approximating a contour of the object region in each of the frames ~~with a polygon~~, the polygon having vertexes;

associating each of the vertexes in each of the frames with each of the ~~respective same~~ vertexes in an adjacent frame ~~of each of the frames~~;

obtaining trajectories, each of the trajectories linking the same vertexes through the frames ~~associated together~~ based on the time-series variation of the frames; and

generating the object region data based on the trajectories.

2. (Currently Amended)) The method according to claim 1, wherein each of the vertexes in each of the frames are associated with each of the ~~respective same~~ vertexes in the adjacent frame such that a distance between each of the vertexes in each of the frames and each of the ~~respective same~~ vertexes in the adjacent frame is minimum.

3. (Currently Amended)) The method according to claim 2, wherein the distance between each of the vertexes in each of the frames and each of the ~~respective same~~ vertexes in the adjacent frame is calculated after a center of gravity of the polygon in ~~the~~ each of the frames coincides with a center of gravity of the polygon in the adjacent frame.

4. (Currently Amended)) The method according to claim 2, wherein ~~each of the~~ trajectories ~~is~~ are respectively approximated by a predetermined ~~functions~~ function, and the object region data is generated by using ~~a parameter for the function~~ functions.

5. (original) The method according to claim 2, wherein the object region data includes position data of the vertexes of each of the frames and association data indicting correspondence of the vertexes between the frames.

6. (Currently Amended)) A method according to claim 1, wherein the associating ~~each of the~~ vertexes with ~~each of the~~ respective same vertexes comprises estimating vertexes in the adjacent frame based on the trajectories ~~vertexes in the frames preceding to the adjacent frame~~, and selecting the vertexes in the adjacent frame, that are closest to the estimated vertexes.

7. (Currently Amended)) The method according to claim 6, wherein ~~each of the~~ trajectories ~~is~~ are respectively approximated by a predetermined ~~function~~ functions, and the object region data is generated by using ~~a parameter for the function~~ functions.

8. (original) The method according to claim 6, wherein the object region data includes position data of the vertexes of each of the frames and association data indicting correspondence of the vertexes between the frames.

9. (Currently Amended)) The method according to claim 1, wherein the associating each of the vertexes with each of the vertexes comprises obtaining the vertexes in each of frames have a characteristic quantity of the vertexes of each of the frames and associating the vertex in each of the frames and the same vertex in the adjacent frame which have the closest characteristic quantity are associated with each other.

10. (Currently Amended)) The method according to claim 9, wherein ~~each of the trajectories is~~ are respectively approximated by a predetermined ~~function~~ functions, and the object region data is generated by using ~~a parameter for the function~~ functions.

11. (original) The method according to claim 9, wherein the object region data includes position data of the vertexes of each of the frames and association data indicting correspondence of the vertexes between the frames.

12. (Currently Amended)) A method of generating object region data relating to an object region in moving picture data having a plurality of frames, the method comprising:

generating a polygon approximating a contour of the object region in each of the plurality of several frames with a polygon, the polygon having vertexes;

associating each of the vertexes in each of the several frames with each of the same vertexes in an adjacent frame;

obtaining trajectories, each of the trajectories linking the same vertexes through the several frames;

estimating a plurality of positions of vertexes of the a polygon in a next frame based on the trajectories, the next frame following a last frame of the frames for which the

~~trajectories are obtained trajectory data indicating vertexes of the polygon from a first frame to an immediately preceding frame of the given frame;~~

~~modifying the plurality of moving the position-estimated vertexes estimated so as to be associated in accordance with a contour of the object region in the next frame;~~

~~obtaining trajectory data indicating vertexes of the polygon from the first frame to the given frame updating the trajectories by associating each of the moved vertexes with trajectories linking the vertexes which are the same as the moved vertexes; and~~

~~generating the object region data based on the updated trajectories trajectory data indicating vertexes of the polygon from the first frame to the given frame.~~

13. (Currently Amended)) The method according to claim 12, wherein ~~each of the plurality of trajectories is~~ are respectively approximated by a predetermined ~~function functions~~, and the object region data is generated by using ~~a parameter for the function functions~~.

14. (Currently Amended)) The method according to claim 12, wherein the object region data includes position data of the vertexes of each of the ~~plurality of frames~~ and association data indicting correspondence of the same vertexes between the ~~plurality of frames~~.

15. (Canceled)

16. (Currently Amended)) An apparatus for generating object region data relating to an object regions region in frames of moving picture, the frames lined up in a time-series variation, the apparatus comprising:

an approximation unit configured to generate a polygon approximating a contour of the object region in each of the frames, the polygon having vertexes;

an association unit configured to associate each of the vertexes in each of the frames with each of the same vertexes in an adjacent frame;

a trajectory obtaining unit configured to obtain trajectories, each of the trajectories linking the same vertexes through the frames based on the time-series variation of the frames;  
and

an object region data generation unit configured to generate the object region data based on the trajectories.

~~an approximation unit configured to approximate the object region in each of the frames with a polygon, the polygon having vertexes;~~

~~an association unit configured to associate the vertexes in each of the frames with the respective vertexes in an adjacent frame of each of the frames;~~

~~a trajectory unit configured to obtain trajectories linking the vertexes associated together based on the time-series variation of the frames; and~~

~~a data generation unit configured to generate the object region data based on the trajectories.~~

17. (Currently Amended) The apparatus according to claim 16, wherein the association unit associates each of the vertexes in each of the frames with each of the respective same vertexes in the adjacent frame such that a distance between each of the

vertexes in each of the frames and each of the respective same vertexes in the adjacent frame is minimum.

18. (Currently Amended) The apparatus according to claim 16, wherein the association unit comprises an estimation unit configured to estimate vertexes in the adjacent frame based on the trajectories ~~vertexes in the frames preceding to the adjacent frame~~, and a selector configured to select the vertexes in the adjacent frame, that are closest to the estimated vertexes.

19. (Currently Amended) The apparatus according to claim 16, wherein the association unit is configured to obtain ~~the vertexes in each of frames have~~ a characteristic quantity of the vertexes of each of the frames and to associate the vertex in each of the frames and the same vertex in the adjacent frame which have the closest characteristic quantity ~~are associated with each other~~.

20. (Currently Amended) An apparatus for generating object region data relating to an object region in moving picture data having a plurality of frames, the apparatus comprising:

an approximating unit configured to generate a polygon approximating a contour of the object region in several frames, the polygon having vertexes;

an association unit configured to associate each of the vertexes in each of the several frames with each of the same vertexes in an adjacent frame;

a trajectory unit configured to obtain trajectories, each of the trajectories linking the same vertexes through the several frames;

an estimation unit configured to estimate positions of vertexes of a polygon in a next frame based on the trajectories, the next frame following a last frame of the frames for which the trajectories are obtained;

a moving unit configured to move the position-estimated vertexes in accordance with a contour of the object region in the next frame;

an updating unit configured to update the trajectories by associating each of the moved vertexes with trajectories linking the vertexes which are the same as the moved vertexes; and

an object data generation unit configured to generate the object region data based on the updated trajectories.

~~an approximation unit configured to approximate the object region in each of the plurality of frames with a polygon;~~

~~an estimation unit configured to estimate a plurality of vertexes of the polygon in a given frame based on trajectory data indicating vertexes of the polygon from a first frame to an immediately preceding frame of the given frame;~~

~~a modifying unit configured to modify the plurality of vertexes estimated so as to be associated with the object region in the given frame;~~

~~a trajectory unit configured to obtain trajectory data indicating vertexes of the polygon from the first frame to the given frame; and~~

~~a data generation unit configured to generate the object region data based on the trajectory data indicating vertexes of the polygon from the first frame to the given frame.~~

21. (Canceled)

22. (Currently Amended) An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein, the computer readable program code means generating object region data relating to an object region in frames of moving picture, the frames lined up in a time-series variation, the computer readable code means comprising:

first computer readable program code means for causing a computer to ~~approximate the object region in each of the frames with a polygon, the polygon having vertexes generate~~ a polygon approximating a contour of the object region in each of the frames, the polygon having vertexes;

second computer readable program code means for causing ~~[[a]]~~ the computer to associate each of the vertexes in each of the frames with the same ~~respective~~ vertexes in an adjacent frame of each of the frames;

third computer readable program code means for causing ~~[[a]]~~ the computer to obtain trajectories, each of the trajectories linking the same vertexes through the frames ~~associated together~~ based on the time-series variation of the frames; and

fourth computer readable program code means for causing ~~[[a]]~~ the computer to generate the object region data based on the trajectories.

23. (Currently Amended) The article of manufacture according to claim 22, wherein the second computer readable program code means causes ~~[[a]]~~ the computer to associate each of vertexes in each of the frames with ~~the respective~~ each of the same vertexes in the adjacent frame such that a distance between each of the vertexes in each of the frames and each of the same ~~respective~~ vertexes in the adjacent frame is minimum.



24. (Currently Amended) The article of manufacture according to claim 22, wherein the second computer readable program code means causes ~~[[a]]~~ the computer to estimate trajectories ~~vertexes in the frames preceding to the adjacent frame,~~ and select the vertexes in the adjacent frame, that are closest to the estimated vertexes.

25. (Currently Amended) The article of manufacture according to claim 22, wherein the second computer readable program code means is configured to obtain the vertexes in each of frames have a characteristic quantity of the vertexes of each of the frames and to associate the vertex in each of the frames and the same vertex in the adjacent frame which have the closest characteristic quantity ~~are associated with each other.~~

26. (Currently Amended) An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein, the computer readable program code means comprising:

first computer readable program code means for causing a computer to ~~approximate the object region in each of the plurality of frames with a polygon~~ generate a polygon approximating a contour of the object region in several frames, the polygon having vertexes;

second computer readable program code means for causing ~~[[a]]~~ the computer to estimate a plurality of vertexes of the polygon in a given frame based on trajectory data ~~indicating vertexes of the polygon from a first frame to an immediately preceding frame of the given frame~~ associate each of the vertexes in each of the several frames with each of the same vertexes in an adjacent frame;

third computer readable program code means for causing ~~[[a]]~~ the computer to ~~modify the plurality of vertexes estimated so as to be associated with the object region in the given~~

frame obtain trajectories, each of the trajectories linking the same vertexes through the several frames;

fourth computer readable program code means for causing [[a]] the computer to obtain trajectory data indicating vertexes of the polygon from the first frame to the given frame estimate positions of vertexes of a polygon in a next frame based on the trajectories, the next frame following a last frame of the frames for which the trajectories are obtained;  
[[and]]

fifth computer readable program code means for causing [[a]] the computer to generate the object region data based on the trajectory data indicating vertexes of the polygon from the first frame to the given frame move the position-estimated vertexes in accordance with a contour of the object region in the next frame;

sixth computer readable program code means for causing the computer to update the trajectories by associating each of the moved vertexes with trajectories linking the vertexes which are the same as the moved vertexes; and

seventh computer readable program code means for causing the computer to generate the object region data based on the updated trajectories.

Claim 27 (Canceled).